Form ESA-B4. Summary Report for ESA-089-3
Public Report - Final

Company	United States Steel Corporation	**ESA Dates**	6/17/2008 – 6/19/2008
Plant	Irvin Plant	**ESA Type**	Pumping System Assessment
Product	Steel	**ESA Specialist**	John Seryak

Brief Narrative Summary Report for the Energy Savings Assessment (ESA):

Introduction:
The U. S. Steel - Irvin Plant located in Dravosburg, PA, manufactures hot-rolled, cold-rolled, galvanized, and "Galvalume" sheet steel.

U. S. Steel's Irvin Plant receives steel slabs as its raw material. The material is sent through several mills, pickling lines and galvanizing lines. At many points in this process the material and the manufacturing equipment needs cooling. The solution, HPH and scale pumps are all part of the cooling process.

Objective of ESA:
The objective of the ESA was to provide the U. S. Steel - Irvin Plant staff with technical assistance targeted at reducing pumping energy and costs.

Focus of Assessment:
The ESA focused on pumps and pumping systems, specifically the solution, HPH and scale pit pumps.

Approach for ESA:
To this end, on-site training was provided for evaluating pumping systems. The training included an instructional review of pump curves, system curves, fluid work equations and theory, savings calculation methodology and evaluation approaches. Additionally, instruction was provided on the use of the Department of Energy's Pumping System Assessment Tool (PSAT) for system evaluation and quantification of energy and cost savings. Finally, the solution, HPH and scale pit pumping systems were selected and evaluated quantitatively, using PSAT while simultaneously applying pumping fundamentals and using performance curves by hand.

General Observations of Potential Opportunities:
- U. S. Steel - Irvin Plant uses about 315,512,000 kWh annually, a load of about 36 MW. All electricity is purchased from the electric utility and there is no on-site generation.
- U. S. Steel - Irvin Plant uses a significant amount of natural gas for process and space heating, about 1,843,820 MMBtu annually. Coke Oven gas is also used, about 4,975,200 MMBtu annually.
- Below is a list of Near Term and Medium Term opportunities identified in the systems evaluated at the plant.

- Near Term
  - Increase Well Level on HPH Hot Well – The HPH hot-well pumps draw water from the hot-well and pump it to the cooling tower. The tank is about kept about half full, and thus there is likely 7.5-ft of excess space. The tank is on the suction side of the HPH hot-well pumps. Thus, maintaining a higher operating level by just a few feet would reduce the overall amount of head required from the pump. The electricity and cost savings would be about 28,243 kWh/year and $1,644 /year, respectively.
  - Increase Well Level on Solution Pump Tanks – The solution pumps draw from three tanks located above and nearby the pumps. The 10,000 gallon tanks are kept at about 6,000-6,500 gallons. Thus, there is likely excess space which would allow an increase in solution water level. The tank is on the suction side of the solution pumps. Thus, maintaining a higher operating level by just a few feet would reduce the overall amount of head required from the pump. The electricity and cost savings would be about 636,765 kWh/year and $38,206 /year, respectively.
- Medium Term
  - Install VFD and Open Throttle on HPH Pumps – The HPH hot-well pumps draw water from the hot-well and pump it to the cooling tower. There are three pumps which deliver about 1,470 gpm at 100.6 ft-H2O. A butterfly valve in the common header is throttled to the 50% open position to balance flow between the hot-well and cold-well pumps. The butterfly valve could be fully opened or removed, and the flow control met with a VFD instead. Flow would remain the same, about 1,470 gpm, but pump head and thus pump and motor work would be reduced significantly. The electricity and cost savings would be about 564,598 kWh/year and $33,876 /year, respectively.
  - Install VFD on North Pit Scale Pump – The north pit scale pump draws water from the north scale pit and sends it to the water treatment plant. There are three pumps, one of which is typically cycling to help balance flow. Flow is about 6,000 gpm while head is 84.1 ft-H2O. As mentioned, one of the three pumps often cycles to meet flow requirements. Over a period of time, say 15 minutes or 30 minutes, the same amount of flow could be provided by letting the pump run constantly but at a slower speed using a VFD. The electricity and cost savings would be about 303,702 kWh/year and $18,222 /year, respectively.
  - Install VFD on South Pit Scale Pump – The south pit scale pump draws water from the south scale pit and sends it to the water treatment plant. There are three pumps, one of which is typically cycling to help balance flow. Flow is about 14,000 gpm while head is 63.7 ft-H2O. As mentioned, one of the three pumps often cycles to meet flow requirements. Over a period of time, say 15 minutes or 30 minutes, the same amount of flow could be provided by letting the pump run constantly but at a slower speed using a VFD. The electricity and cost savings would be about 803,966 kWh/year and $48,238 /year, respectively.
  - Install VFD and Partially Close Bypass on Solution Pumps – The solution pumps bypass 100% of flow about 20% of the time, during threading. During this time, the three 500-hp pumps deliver 2,120 gpm at 330 ft-H_2O. During bypass mode, a VFD could be installed to reduce flow by 70%. This would greatly reduce energy requirements while not damaging the motor from low loads. The bypass valves would have to be left at least 30% open. The electricity and cost savings would be about 1,117,233 kWh/year and $67,034 /year, respectively.

- The percent electricity savings from the above identified opportunities is 5.7% of overall electricity use of the plant. There would be no associated natural gas savings.

Management Support and Comments:
Management was supportive of the opportunities identified and there was general agreement to pursue implementation of these opportunities. Comments are provided in the evaluation forms.

DOE Contact at Plant/Company:
For follow-up regarding plant progress at implementing the above identified opportunities and other opportunities identified directly or indirectly as a result of this ESA, DOE would contact Mr. Eric Williams, PO Box 878, Dravosburg, PA, 15034. (412) 675-2712, ewilliams@uss.com.